Soil Conservation

August 1979

U.S. Department of Agriculture

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From the Administrator

Better Facts, Better Programs

In designing local, State, and national conservation programs, the need has never been greater for reliable data about natural resource conditions and trends.

The National Resource Inventories (NRI) are providing a welcome first round of those data. Phase 1, now completed, already marks the most comprehensive resource information we have had since the 1967 conservation needs inventory. Phases 2 and 3 will be done by 1980.

We are grateful for the amount of time and care used by SCS field employees, with the support and cooperation of local conservation districts, in gathering information from more than 200,000 sample points since 1977.

The summaries of their effort give fresh insight on soil quality, land and water use, conservation needs, floodprone areas, wetlands, sheet and rill erosion and wind erosion, potential for new cropland, prime farmlands, and irrigation. They will be tremendously useful in the Resources Conservation Act appraisal and program process; in the legislative arena; and in current and long-range programing by conservation districts and State groups.

The data need to be used with as much care as they were collected. For example, the new national average for soil loss by sheet and rill erosion on all cropland is 4.8 tons an acre each year. Several writers have concluded that "Soil losses have been much less than previously reported," and some may infer that our soil erosion problems are over. Yet:

- Two billion tons of soil lost annually still is a critical problem that affects food and fiber production, water quality, energy use, and other parts of America's economy and environment.
- "Average" figures mask the serious soil-loss rates on critically eroding areas where our targeted conservation assistance is an urgent priority.
- "Average" figures also mask the much lower erosion rates that many land users have achieved through conservation tillage and other methods with our help. Their success cannot be a one-time thing; the practices or systems must be maintained and in some cases replaced to continue the protection.

The NRI will give a better idea of the challenges ahead. It is up to every SCS employee and every district official or manager to find and use other better ideas to go along with them.

Mel Davis

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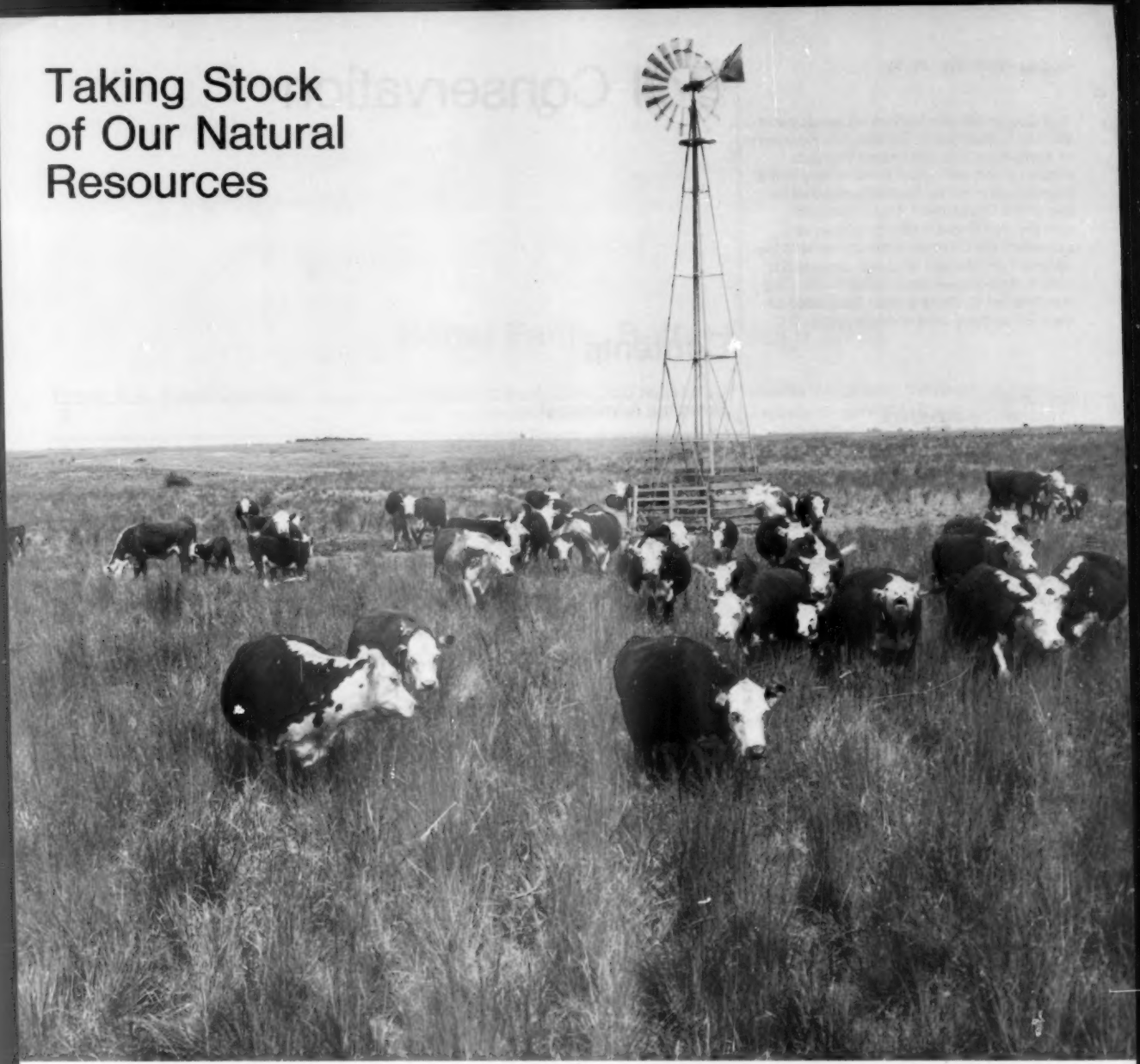
Cover:
A dairy herd grazes a pasture of pangolagrass in Ward Valenciano, Juncos, P.R. Grassland acreage is expanding to cover hillsides once scarred with erosion from sugarcane and row crops. See article beginning on page 10. (Photo, Emérito Martínez-Ruiz.)

Taking Stock of Our Natural Resources



The National Resource Inventories include data on non-Federal land available for grazing. The inventories show that some 40 percent of rangeland is in good to excellent condition compared to only 20 percent in these categories 15 years ago.

Background

Results of Phase 1 of the National Resource Inventories (SCS–NRI) are now available. The Soil Conservation Service began the inventories in March 1977 in order to provide current resource data to:

- Respond to findings of the USDA Task Force on Adequacy of Conservation Systems on Cropland;
- Answer Senate Committee on Agriculture, Nutrition, and Forestry requests for information about program needs and progress;
- Meet recommendations of the task force on "Future Directions of SCS";
- Answer General Accounting Office questions related to an audit;
- Update 10-year-old estimates of conservation needs and soil erosion; and
- Aid in appraisal of resource conditions and trends that would be called for in a Soil and Water Resources Conservation Act (RCA), which was enacted in fall 1977.

The inventories were designed to provide statistical data for non-Federal lands in each State (except Alaska) in the United States and in the Caribbean Area. They used about one-third of the randomly selected sample areas that were used in the 1967 national inventory of soil and water conservation needs. Data were collected by SCS field employees at 70,000 primary sample units and more than 200,000 sample points.

Phase 1 of the SCS–NRI includes data on land capability classes (soil quality), land use and use of small water areas, conservation needs, floodprone areas, wetland types 3 to 20, sheet and rill erosion, wind erosion in the 10 Great Plains States, potential for new cropland, irrigation, and prime farmlands.

Phase 2 of the inventories will be completed later this year and will include data on gully, streambank, roadside, and construction-site erosion.

Phase 3, the last in this inventory cycle, will be completed in 1980. It will include using new data in a computer model to estimate sediment delivery for major river basins (hydrologic units).

SCS–NRI data will be used by SCS State offices for long-range soil and water conservation programing and planning. These data and other current information also are being used in the first RCA appraisal and program now underway. Decisionmakers in other agencies as well as private firms, groups, and organizations that need current natural resource information will find the data useful for selecting resource-oriented research, activities, and evaluations.

These inventories will be updated on a continuing basis as the need arises for up-to-date information.

The Findings

Soil Quality

Rural land available for agricultural, forestry, and other uses declined by nearly 37 million acres in the 1967-77 period. Yet the percentage of good, fair, and poor land remained about the same. That is, 44 percent of the rural land (613 million acres) is in land capability Classes I–III, 13 percent is in Class IV (189 million acres), and 43 percent is in Classes V-VIII (599 million acres).

Soil Quality—Non-Federal Rural Land (Excluding Alaska).

Condition*	Million Acres	Percent
Level	414	29
Sloping	1,021	71
Wet	269	19
Droughty	402	29
Flood Prone	175	12

*Some soils are sloping but wet, level but droughty, etc.

Of the total rural non-Federal land, 414 million acres occur on level to nearly level topography and over 1 billion acres occur on gentle to very steep slopes. At least 269 million acres have a natural wetness condition, while nearly 402 million acres are droughty or lack sufficient water to grow agricultural or forestry crops. Some lands are sloping and wet, others may be level and droughty. Many of these conditions, singly or in combination, limit the use of land.

Land Use

Cropland: There is a continuing decline in the acreage of non-Federal land used for growing crops in the United States. During the 10-year period from 1967 to 1977, acres in cropland decreased by 18 million, from 431 million to 413 million. This represents a decrease of 1.8 million acres a year. The rate is considerably less than the decline of the 1950's, but about the same as the decline of the 1960's. The 1977 SCS–NRI data show that land users retained the better land for cropland. Since 1950, there has been a 3-percent increase in the use of good land (capability Classes I–III) for cropland and a 4-percent decrease in cropping of poor land. Use of fair (marginal) lands increased by 1 percent.

Grassland and forest land: Land available for grazing has increased greatly; it accounted for 541 million acres in 1977. Now, over half of the non-Federal agricultural land is used for native pasture, pastureland, and rangeland. The SCS–NRI data show an overall decline in non-Federal forest land. In 1967, there were 444 million acres of non-Federal forest land. The total decreased to 370 million acres in 1977, a change of 74 million acres.

Urban and built-up: The 1977 data confirmed previous estimates that homes, factories, roads, and other similar uses are absorbing rural land at a rapid pace. Some 90 million acres now are in these uses or committed to these uses. Another 4 million acres are in very small built-up areas and are considered part of the other rural land uses. Nearly 95 percent of the rural land shifted from agricultural, forestry, and other uses is related to urban development. The remaining 5 percent of land changed to small water areas. The data suggest that land is converted to these irreversible uses at a rate of about 3 million acres a year. About 10 percent of the land converted to small water areas and 30 percent of the urban and built-up areas come from land formerly used for cropland.

Use of Small Water Areas

Small water areas increased by more than 1 million acres in the 1967-77 period. SCS–NRI data show that the total 9 million acres of small water is evenly divided between small streams (less than 1/8-mile wide) and water bodies (less than 40 acres). About 4 million acres of small water are used primarily for recreation, including fish and wildlife. Nearly 3 million acres are useful for livestock water supply.

Conservation Needs

Some 892 million acres of non-Federal agricultural and forest land needed conservation treatment in 1977. The total did not change significantly over the 10-year period, but the kind of treatment needed—and the kinds of land requiring treatment—did change distinctly. In 1967, 64 percent (272 million acres) of cropland needed treatment; 58 percent (241 million acres) required treatment in 1977, a decrease of 6 per-

Use of Prime Farmland in 1977.

Land Use	Acres (millions)	Percent
Cropland	231	67
Native Pasture and Pastureland	39	11
Rangeland	23	7
Forest Land	42	12
Other Land	11	3
Total	346	100

cent for cropland. Total acres in pastureland and rangeland increased, as did the treatment needs. In 1967, 71 percent (346 million acres) needed treatment; this increased to 75 percent (404 million acres) in 1977. Surprisingly, the percentage of forest land needing treatment increased from 62 percent to 67 percent in the 10-year period while the acreage of forest land decreased.

Floodprone Areas

SCS–NRI data specifically identified the acreage of floodprone areas and furnished valuable new information on the use and quality of this fragile resource. There are 175 million acres of floodprone areas in the non-Federal land area of the United States (excluding Alaska). About 32 percent (54 million acres) is pastureland, native pasture, and rangeland. Another 30 percent (52 million acres) is forest land. Another 27 percent (48 million acres) is cropland. The remaining 11 percent is in other land uses. About 46 percent of the floodprone land is of good quality (capability Classes I–III) and 54 percent is fair to poor (Classes IV–VIII).

Prime Farmlands

The 1975 estimates showed 384 million acres of non-Federal prime farmlands in the United States and Caribbean Area; the 1977 SCS–NRI data showed 346 million acres. The latter figure is a more accurate measure of these important farmlands. Three States have more than 20 million acres each of prime farmland, four States have 15 to 20 million acres each, seven States have 10 to 15 million acres each, and nine States have 5 to 10 million acres each. Some 67 percent of the prime farmland already is being used for cropland. Only 116 million acres of prime farmland are in other uses. Of these, 1977 SCS–NRI data showed that only about 45 percent (52 million acres) could practicably be shifted to cropland production.

Sheet and Rill Erosion

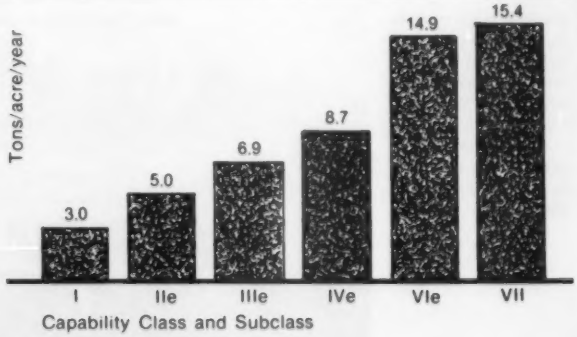
Estimated average annual sheet and rill erosion for all cropland is 4.8 tons per acre. Cropland erosion rates range from less than 1 ton in some States to more than 41 tons per acre for the Caribbean Area. Estimates in 1967 showed annual cropland erosion rates of 5.9 tons per acre and a total of 2.6 billion tons eroded. In 1977, the amount was down to 2 billion tons annually.

This bright picture is dimmed by the fact that 22 States, mainly in the central and eastern part of the United States and the Caribbean Area, have average annual erosion rates for cropland of 4 tons or more per acre. Seven States and the Caribbean Area have more than 8 tons. Sloping croplands are eroding at one to nearly four times their permissible rates. Some nearly level wet soils in the Delta region are eroding at above permissible rates. Non-Federal pastureland and native pasture in 11 States and the Caribbean Area have average annual erosion rates of more than 4 tons per acre. Non-Federal rangeland erosion rates in five States and the Caribbean Area are over 4 tons per acre. Except for three States and the Caribbean Area, erosion rates for non-Federal forest land are not high; but grazed forest land is eroding three times as much as nongrazed forest land.

Wind Erosion in the Great Plains

Average annual soil loss on cropland in the 10 Great Plains States from erosion by wind is 5.3 tons per acre. Annual rates for each State range from 1.3 tons

Estimated Average Annual Sheet and Rill Erosion on Cropland in the United States in 1977, by Capability Class.



per acre to 14.9 tons per acre. Three of the States have rates above 8 tons per acre. Annual erosion by wind on rangeland varies from none in two Great Plains States to 6.2 tons per acre for one State.

Potential for New Cropland

A 1975 SCS inventory that estimated how much non-Federal pastureland, rangeland, forest land, and land in other uses could be converted to cropland created much interest and debate. New data were collected for the 1977 SCS–NRI, based on 1976 prices and costs. Although this non-Federal rural land with high or medium potential for conversion to cropland was estimated at 135 million acres in 1977 compared to 111 million acres in 1975, the acreage with high potential was down by nearly 50 percent. The acreage of non-Federal land with medium potential for conversion was up to 95 million acres, suggesting that (1) conversion problems were thought to be more complex in 1977 than in 1975, or (2) prices received versus the cost to produce a crop were such that more land with conservation problems might be brought into production in 1977.

Irrigated Land

The acreage of irrigated land has increased sharply. In 1967, 47 million acres of cropland and pasture were irrigated; in 1977, the total was 62 million acres. Irrigation is no longer confined to the dry areas of the West—SCS–NRI data show that all but two States now irrigate some lands. Three States irrigate more than 5 million acres each and 14 States irrigate 1 to 5 million acres each. Most of the land (63 percent) is irrigated by use of gravity systems. Another 23 percent is irrigated by use of pressure systems. The remaining 14 percent uses a combination of both.

Wetlands

New data are available on the use, composition, and potential of wet soils and wetland types 3 to 20. Except for areas classified as open water, there are 42 million acres of non-Federal wetlands in the United States, of which 40 million acres (97 percent) are in noncropland uses. Forested wetlands account for 50 percent of the acreage. None of the wetlands has potential or is available for conversion to cropland. By contrast, the United States (except Alaska) has 269 million acres of wet soils on non-Federal lands. Nearly 105 million of these acres are now cropped; of the other 164 million, only 31 million have potential for conversion to new cropland.

Conclusion

The 1977 data indicate that erosion rates for cropland are lower and the amounts less than predicted in earlier studies. Nevertheless, erosion by wind and water remains a serious problem. Erosion rates are above permissible levels for all sloping soils and are surprisingly high for some level or nearly level wet soils. Most attention needs to be given to the problem of erosion on these wet soils.

The rate of conversion of land to urban and built-up areas has increased significantly during the past 10 years. A large percentage of the land converted each year is high-quality cropland that has few or no inherent conservation problems and on which conservation measures have been applied to minimize erosion.

A swine herd grazes on irrigated pasture in North Carolina. The inventories indicate that irrigated acreage has increased sharply and is no longer confined to dry areas of the West.

It's a Natural

by Loren J. Pearson
and Lawrence Tedford

When herds of bison roamed the Great Plains, they grazed down an area, then quickly moved on to another. A northwest Kansas rancher, Don Smith, is taking a range management lesson from the bison's grazing pattern.

"The key to grazing management on native range," he explained, "is to have the cattle graze a pasture rapidly and uniformly—like we do wheat pasture—till the proper amount is removed, then move them into the next pasture.

"If a rancher does a good job of grazing wheat pasture, he can do a good job of rotation grazing on native rangeland."

Smith's rotation grazing system is made up of three pastures of unequal size and carrying capacity. Grazing begins in mid-May and continues in the first pasture until about July 1.

Then he moves his cattle into the second pasture and they stay until the grass is properly used, usually in mid-August. He winds up his grazing season in the third pasture. The next year this is the pasture that is grazed first in his rotation system.

Smith has found that a grazing system provides his operation with some added benefits. "We've never had to move our cattle because of lack of grass," he said. "The maturity of the grass governs when we move the cattle to the next pasture."

Smith is a cooperator with the Sherman County Conservation District. In 1972 he signed a Great Plains Conservation Program contract with the Soil Conservation Service for help with erosion control and range management. Under the contract, SCS assisted him with his grazing system.

Smith carries out his grazing system on 4,500 acres of native prairie, where the vegetation is mostly blue grama and buffalograss on the upland sites and western wheatgrass on lowland terrace sites. Stands of big bluestem, sideoats grama, indiangrass, and switchgrass can be found along some stream channels.

Rainfall is the most limiting factor affecting grass production in the area. Average annual precipitation is about 17 inches, with about three-fourths of it falling between April 1 and October 1. Since variable weather makes it difficult to determine the proper stocking rate for any given season, Smith's system offers a big advantage because he can adjust cattle numbers from year to year, based on available grass.

He advises that for evaluating a total management program one should consider the effect on the grassland, the individual animal performance, and pounds per acre of beef produced. He started managing his present operation in 1969 by recording "in" and "out" weights on his steers. These weights are the data for animal performance and pounds of beef per-acre produced. Range condition and plant vigor help him predict the ability of his range unit to sustain grazing pressure. If a range unit is severely overgrazed, the effect will be reduced forage production the following year and poor animal performance while on grass.

Smith initiated a rotational grazing program during the 1975 grazing season. His average daily gains in 1975 were equal to the previous 5-year average under continuous grazing. "Our gains in 1976 averaged slightly over 2 pounds per day," he said. "This exceeded the continuous grazing average by nearly a pound per day. Our carrying capacity is definitely increasing on the total unit. We were in a dry weather cycle in 1978, but the grass looked as good then as it ever had, and our gains were at least as good as in 1977.

"Rotation grazing will not solve every grazing management problem that confronts the rangeland manager, but it can help. Each system has to be designed on an individual basis.

"It takes a lot of discipline to manage a unit right," Smith concluded. "You need to realize that once a pasture has been grazed, it is best to let it grow for next year. The increased vigor of the plants next year will offset any extra grazing I get this year."

Under ranching conditions, Don Smith has shown that the rotation grazing approach is producing extra grass and extra pounds of beef.

In the fall of 1978 in recognition of his achievements, he received the award for Excellence in Grazing Management from the Kansas-Oklahoma section of the Society of Range Management.

Mr. Pearson is area range conservationist, SCS, Hays, Kans.
Mr. Tedford is district conservationist, SCS, Goodland, Kans.

Puerto Rico Reshapes Its Land Use for Improved Agricultural Production

Housing projects near Arecibo spread into land that once grew sugarcane. Valuable farmland in the northern section of Puerto Rico is going out of production due to urban land needs.

by Rafael A. García

Limited food and fiber production versus increasing population is an economic problem that faces many people in many parts of the earth today. Puerto Rico is one of those places and Puerto Ricans are working on a solution based on better resource management.

Puerto Rico now imports 80 percent of its food and fiber needs, up considerably since 1950. Population for the island stands at about 3½ million and is expected to reach 5 million by the turn of the century. Cities and towns, expanding to house population growth, are taking acres of good cropland out of production.

Aiming to reverse this trend, Puerto Rico's Governor Carlos Romero-Barceló, with concurrence from President Carter, requested an indepth study of the problem. U.S. Secretary of Commerce Juanita Kreps and Miguel Rivera-Ríos, chairperson of Puerto Rico's Planning Board, coordinated this overall interagency study involving 12 Cabinet-level departments. The formal title of the study is "Puerto Rico Agriculture, Food, and Rural Living: Opportunities, Constraints, and Alternative Public Policies for the Future."

Puerto Ricans weren't facing starvation or unusually poor diets, according to the study. But the population, in general, did face a serious growing economic problem as more and more food was shipped into the island and less and less grown by local farmers.

As part of the study, the U.S. Department of Agriculture (USDA) was assigned a leading role in the analysis of the status of agriculture, food consumption, and rural living conditions. This included an assessment of programs—government and nongovernment—and an evaluation of alternative strategies for improving these aspects of Puerto Rico's economy.

It also included the assessment of the Commonwealth's future food and fiber needs and its potential agricultural production capabilities. USDA's Soil Conservation Service (SCS), one of the 13 USDA agencies involved in the study, was involved in determining agricultural production capabilities.

Historically, Puerto Rico's major agricultural crops had been sugar, coffee, and tobacco. Numerous other crops were grown but largely for farm family use, not for marketing. Thirty to forty years ago, sugarcane plantings covered tremendous amounts of land. In fact, the increased sugarcane acreage created a serious erosion problem. When flatland acreage, where sugarcane normally was grown, was covered with cane, the cane was planted on steep hillsides. Because the hillside planting had little ground cover, soil washed down the hills into streams and reservoirs. This erosion, in turn, robbed the reservoirs of water storage capacity as sediment filled them. This meant irrigation water needed for crops and municipal water supplies was reduced.

During this same period, Puerto Rico's administration introduced a program called "Operation Bootstrap" aimed at building industry on the island. With new industries setting up operations, many islanders found better jobs in the cities leaving idle farms behind. While this change was taking place, sugar and tobacco markets were dwindling due to economic changes. This brought a gradual end to tobacco planting and a sizable reduction in sugarcane plantings on the steep slopes. This shift in agriculture did reduce the serious erosion problem that had plagued the countryside. Unfortunately, the damage had already been done to the island's water storage reservoirs. In seven of the largest lakes, a total of 32,500 acre-feet—more than half of their total capacity—had been lost to sediment during the 40-year period.

During the same period, agriculture had dropped from being the island's leading business to its smallest. Today, 6 percent of the island's total work force is employed in agriculture-oriented jobs. Forty years ago, the figure was 36 percent.

Fortunately, the Puerto Rican administration hasn't given up on the island's agricultural problems. Local soil conservation districts (SCD's) are taking a more active role in coordinating the various natural resource development programs and the technical assistance from Federal and Commonwealth agencies. SCS technicians, working through local SCD's, are helping landowners and farmers plan resource protection measures designed to preserve productivity and reduce water runoff and erosion.

One of the big plusses today is the gradual expansion of grassland acreage. Many hillsides, once scarred with erosion from sugarcane and row crops, are now covered by lush green pastures, grazed by beef cattle or dairy herds. Grasses, recommended by SCS, have improved beef and dairy production. Springs and ponds have been developed with SCS designs to provide additional stock water for the cattle.

There is also a gradual trend toward more commercial farm operations replacing the older family subsistence operation. A more diversified agriculture base that includes increased production of tropical fruits, a variety of vege-

Steep hillsides in Ward Pitahaya, Luquillo, where sugarcane was once grown are now protected by pangolagrass pastures.

At left, Jose Rivera—a farmer in Ward Cedro Arriba, Naranjito—now uses a drip irrigation system where he once watered by hand.

At right, Lake Caonillas near Utuado is one of seven major reservoirs that have lost over half of their original capacity due to sedimentation from years of upland erosion.

tables, beef, pork, poultry, and dairy products is being encouraged. In a few instances, farmers are using new drip irrigation methods to grow orchards and tomatoes. These new methods conserve scarce water supplies and provide far greater yields of superior fruits and tomatoes on much smaller areas.

One interesting community farming experiment in south central Puerto Rico was started in 1975. This community cooperative venture is called El Melón, a 300-acre hill country area in Coamo. (See article beginning on page 14.) Here the Puerto Rican administration purchased 300 acres of idle farmland and resold it to a group of 24 farmers who were selected as leading conservationists. These farmers will pay the government for their land at a very low interest rate over the next 20 years. Each farmer has a conservation plan for his land, developed with technical assistance from SCS. The government provided plans and material for a home and a chickenhouse on each farm. The farmers have helped each other build these new structures. Plans now call for a second chickenhouse on each farm. In a few years, each farm will have three chickenhouses to raise broilers.

Good roads throughout the 300-acre area have been built by the government. Two deep wells and pumps plus hilltop holding tanks provide the new community with adequate water. Vegetables, fruit trees, and some beef cattle occupy acres not needed for the poultry activity. The hills are protected from erosion by thousands of feet of diversion hillside ditches and grassed waterways.

According to Enrique Ortiz-Torres, head of the Division of Planning in the Commonwealth's Department of Agriculture, "El Melón is working very well. Several similar community projects are in the planning stage. Therefore, we have already purchased 60,000 acres of land in other municipalities which will be used according to their soil capabilities—the right use on the right land. To do this we will use information provided by the SCS Cooperative Soil Surveys."

Antonio Colon, a farmer in Ward Padilla, Corozal, discusses his irrigation system for tomatoes with SCS Soil Conservationist Maria Montes.

Other future plans for improvement of agriculture production on the island, according to the study, call for an increase in woodlands from 66,000 to 220,000 acres. Rice could be produced on 25,000 acres of irrigable lands along the north coast of the island. Pineapple acreages could be increased 50 percent. Tropical fruits, such as mango and avocado, could be economically expanded over 5,000 acres with the use of drip irrigation in the arid southeast part of the island. Plantain yields could be doubled through effective spacing, fertilization, and harvesting. An additional 240,000 acres could be brought into managed pastureland.

There are several alternatives in Puerto Rico's quest for improved food and fiber production. Which direction will be the best to follow is still to be decided. One thing is clear, however, Puerto Ricans don't plan to sit back and let the world provide all their growing food and fiber needs. They do plan to develop their natural resources, protect their attractive tropical landscape, and maintain a sound agricultural base designed to make the best possible use of their island's limited farmland. The study helped them understand their overall food and fiber problems and lay the groundwork for future resource protection projects.

Mr. García is soil conservationist, SCS, Hato Rey, P.R.

Community Resource Planning Takes to the Hills

by Sergio Reyes-Zamora

Otilio Reyes cleans out a hillside ditch on his farm at El Melón. He knows that regular maintenance is necessary to keep the ditches functional.

In the steep, rolling, picture-perfect hills of Coamo in south-central Puerto Rico, 24 farmers demonstrate that community action offers a profitable answer to modern farming. In a project known as "El Melón," these farmers on their 300-acre site have undertaken an experiment in modern resource planning and development.

The lack of water in the area is a problem. The semiarid climate yields annually about 30 inches of rain, most of it falling during the short rainy season from September to November. Therefore, farming in this area has to be oriented toward low-water-consuming operations.

Because Puerto Rico imports about 80 percent of its food, the Commonwealth Rural Development Corporation wanted a project that would boost food production. At the same time, the project had to keep water needs to a minimum while making good use of the natural resources.

One of the main reasons for selecting the municipality of Coamo, located in the northeast part of the Caribe Soil Conservation District (SCD), as the pilot area was the high unemployment rate.

The Rural Development Corporation asked USDA's Soil Conservation Service for assistance in selecting the specific site for the project in the Coamo area. In a series of meetings involving the Agricultural Extension Service, the Agricultural Experiment Station, Water Resources Authority, Sewer and Aqueducts Authority, municipal authorities, community leaders, and SCD supervisors, SCS District Conservationist Anastasio Morales presented detailed information about the area resources. It was agreed that a poultry enterprise should be the main source of income for the project participants and that cultivation of cash crops, vegetables, and fruit orchards should be secondary.

The Puerto Rican administration had purchased 300 acres of idle farmland in Coamo and divided it into 24 farms. A committee including Morales screened more than 100 candidates to select owners for the farms. The candidates were selected primarily according to their knowledge of farming and their willingness to apply soil and water conservation measures to meet the government goal of production with protection of the resource base. Each selected candidate became the owner of a 7- to 40-acre farm, the size being governed by topography and soil limitations based on SCS soil information. The 24 farmers will pay the government for their land at a very low interest rate over the next 20 years.

The project was put into action in December 1975. A small pond located on the original farm was retained as a recreation facility for the community. The farmers and their families worked together to build their homes and the buildings for the poultry enterprise. The Commonwealth government provided

SCS Soil Conservationist Sergio Reyes-Zamora checks a diversion ditch in a hillside field of pigeon peas on one of the El Melón farms. Thousands of feet of these diversions have been constructed in an effort to reduce soil erosion.

materials and basic designs on a long-term loan basis.

At this stage in the planning and development process, SCS gave technical assistance to the 24 farmers as a group to develop a water system for the poultry enterprise and livestock and for small irrigation systems. Two deep wells supply the water for these purposes, each well furnishing about 75 gallons per minute. SCS technicians made studies and provided designs for the pumps to be installed, the storage tanks needed, and the pipelines to convey the water throughout the entire project. Two large water tanks in the project, with a combined storage capacity of 100,000 gallons, supply water for agricultural uses through pipelines to the 24 farms. Water for human consumption is provided separately by the Sewer and Aqueducts Authority.

In addition, three deep wells have been drilled by individual farmers on their farms. One farm, owned by Hipólito Santiago, has a natural spring. "I am a lucky man," said Santiago, "because I have been able to plant about 2 acres of avocado and mango trees and irrigate them with water from the spring using a drip system designed by SCS."

Each farm now has a poultry barn that holds 10,000 chickens. Average production is 50,000 pounds per barn every 8 to 9 weeks. A second poultry barn is under construction on each farm and a third one is planned for 1980.

As to the secondary enterprises, many farmers are cultivating truck crops and vegetables such as tomato, eggplant, pumpkin, corn, pigeon peas, yucca (cassava), pepper, and yams. On other farms, which were kept in pastures, beef cattle and goats are raised.

Each farmer developed a conservation plan with SCS assistance. Many of them have implemented one or more practices. Main conservation measures are hillside ditches and contour farming. About 15 to 18,000 feet of hillside ditches have been established so far. As soon as the final site selection is made for the second and third poultry houses on each farm, more hillside ditches will be established.

According to Agronomist Enrique Ortiz-Torres of the Commonwealth Department of Agriculture, "El Melón is an attempt to use the land according to its capabilities. Because this project is doing well, other projects are now planned."

A similar project, known as "El Ucar," is underway in the Salinas area in the Sudeste SCD. A third project, producing fertile eggs for the poultry projects, is under study for development in Villalba, another town in the Caribe SCD.

The elected leader of the El Melón project, Otilio Reyes, proudly tells his own story to the many visitors that come to study the project from other parts of the island as well as from the mainland and foreign countries. Reyes recalls that during the great depression he worked on Coamo area farms for the Civilian Conservation Corps. He helped lay down rock and vegetative barriers, construct terraces and ditches, and worked on many other conservation practices.

He says, "I was so impressed with the benefits of those conservation practices that my only dream then was to buy a bit of land and put on it the practices that I had helped to establish on other peoples' farms."

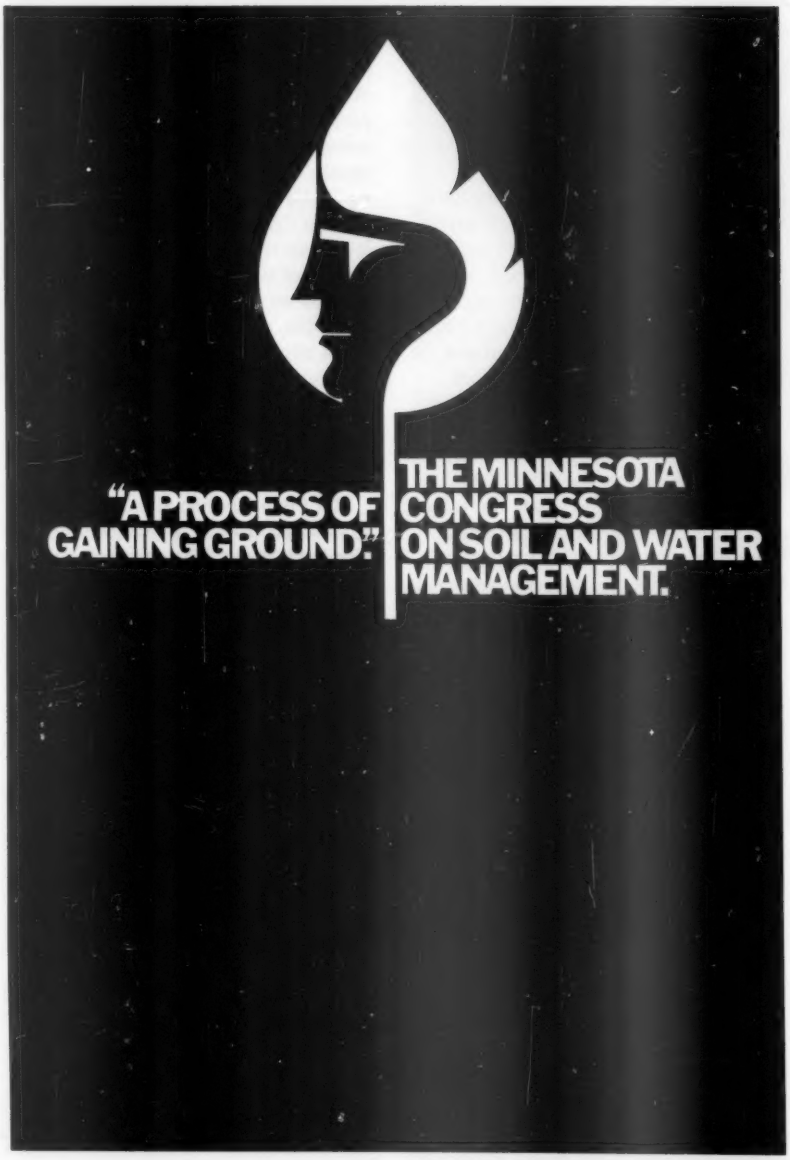
But the economic situation of those days forced Reyes to emigrate to the mainland. There, he performed agricultural tasks until he finally found a better-paying factory job. After many years, he returned to Puerto Rico and renewed his farming work on leased lands. Then came the El Melón project, where Reyes now owns his bit of land.

Because of the conservation work he performed on his farm and his enthusiastic promotion of conservation in his community, Reyes was selected the Conservation Farmer of the Year in 1976 by the Caribe SCD board of supervisors. Reyes' dream came true when he attained his conservation objectives. This was made possible by the El Melón project, a good example of raising the standards of living, through community improvement.

Mr. Reyes-Zamora is soil conservationist, SCS, Juana Díaz, P.R.

RCA: Gaining Ground in Minnesota

A logo, a slogan, and the concept of the Minnesota Congress were designed to signify the involvement of all Minnesotans in the RCA process.



"The 1977 Soil and Water Resources Conservation Act (RCA) is more than a law," according to Harry Major, Soil Conservation Service State conservationist for Minnesota. "It's a management tool, an organizational tool, and a unique opportunity for conservationists to reach the public and have the public reach them."

To fulfill the requirements of the national RCA legislation in Minnesota, the State is conducting "The Minnesota Congress on Soil and Water Management." Major says that when the Minnesota Congress is completed, the State will have "a coordinated program for soil and water conservation that ties together Federal, State, and local soil and water conservation agencies.

"The congress also will have provided Minnesotans with a wealth of information on natural resources," Major continued, "and will have allowed them to influence the programs that address resource problems in their respective districts."

The foundations for the Minnesota Congress were laid in the summer of 1978 when 92 soil and water conservation districts (SWCD's) held 299 meetings attended by 5,200 citizens of the State. These citizens voiced 14 resource problems that they felt were most pressing in their districts. Information was then collected that details the extent of the problems and the costs involved with solving them.

In June of this year, members of the SWCD's, personnel from the U.S. Department of Agriculture and other resource agencies, and representatives of the Minnesota Soil and Water Conservation Board (SWCB) met to propose programs to solve the resource problems that were identified at the

by Corey Bernat

public meetings. Seven separate committees met to formulate proposals for each of seven regions.

The next step in the Minnesota Congress was the launching of a comprehensive public information campaign to explain the problems and proposals, again by region. The public will have an opportunity this fall to indicate how the proposals should be changed to best suit the needs of conservation districts.

Planning and conducting the information campaign has been one of the responsibilities of an "RCA team" consisting of SCS and SWCB personnel. The team, operating under the SCS State conservationist and the director of the SWCB, has responsibility for coordinating the Minnesota Congress. Team members decided that modern advertising techniques should be used to present the Minnesota Congress and the idea of good soil and water management to the public. Because of time and staff limitations, the decision was made to contract for information services from a private agency.

The funds for the contract were made available from national RCA funds through a grant by SCS to the SWCB. Because two levels of government were involved, both State and Federal contracting regulations were followed. The terms of the contract were formulated by the RCA team and government contracting specialists.

After the contract was advertised in March, bids were received from a variety of agencies, ranging from experienced public relations firms to newly established freelance advertisers. One firm specializing in "future planning" also submitted a bid. After reviewing the bids and analyzing each suggested campaign approach, the decision was made to select an established advertising agency with experience in agricultural advertising.

It was this advertising agency which created the name, "The Minnesota Congress on Soil and Water Management." The agency wanted the name to signify that the process involved all of the residents of the State. In addition, it decided that a catchy title would be more likely to influence people to participate in the effort than would a less generally understood phrase such as "the RCA process." The Minnesota RCA team agreed.

The agency also devised the slogan "a process of gaining ground," and created a logo. Other duties of the advertising agency were as follows: solicit material support from private corporations (such as stationery, printing, and radio and television time); secure the services of a national or statewide celebrity with ties to conservation to star in radio and television public service announcements; produce the announcements and provide for air time; and secure the services of a radio or television "personality" to make local appearances. The announcements are scheduled for release in early August, with the local appearances occurring throughout August and September.

An integral part of the information campaign has been the development of a direct mail piece explaining the resource concerns, the proposals, and how the public can respond to the proposals. The advertising agency assisted with layout, design, and editing. This mail piece, aimed at reaching as many varied interests as possible, is scheduled for distribution in the middle of August. It will be sent to nearly 200,000 people.

Toward the end of August or the beginning of September, "The Minnesota Congress on Soil and Water Management Governor's Kickoff" will be held. This event, keynoted by Minnesota Governor Al Quie and the "star" of the public service announcements, is being held to underscore the importance of the Minnesota Congress and to demonstrate the multigovernmental and public participation aspects of the effort. Of course, it is also hoped that the resulting media coverage will influence larger numbers of Minnesotans to reply to the proposals.

In November, after the public responses to the proposals have been analyzed, each of the seven regional task forces will meet again, this time with members from the public at large. The job of the task forces will be to rewrite the regional proposals. These proposals will then be sent to the RCA team for inclusion in the State program.

The result of the Minnesota Congress on Soil and Water Management will be the implementation of a comprehensive State program to correct soil and water conservation problems. It is hoped that through the involvement of the public in writing the program, it will meet the needs of their conservation districts and that the districts in turn will support the program. If, indeed, the Minnesota Congress is successful in reaching this goal, it will mark a new period in the history of Minnesota conservation efforts.

Mr. Bernat is a public information specialist, SCS, St. Paul, Minn.

News Briefs

"Conserving the Nation's Farmland"

A new congressional study says that many Northeastern and Midwestern States are rapidly losing much of their best agricultural land, and that the Nation needs new policies to preserve its remaining farmland.

Rep. Robert W. Edgar (D-Pa.), chairperson of the 213-member Northeast-Midwest Congressional Coalition, said the new report underscores the need for protecting the Nation's prime farmland from urban sprawl and other forms of encroachment.

"Conservation of our prime farmland is important not only to the Midwest, but to Northeastern States as well," Edgar said. "About half of New England's farmland was taken out of production between 1959 and 1977—and those States already import four-fifths of their food from other parts of the Nation."

The study, "Conserving the Nation's Farmland," was prepared by the Northeast-Midwest Institute, a Washington-based research organization.

"This report confirms what many of us in Congress have believed for several years—that unless we do something, we will continue to see an alarming loss of the Nation's prime farmland," said Rep. James M. Jeffords (R-Vt.), a member of the coalition's steering committee.

"We simply don't know how much prime land we are losing each year," Jeffords said, "and we need better information to preserve this vital national resource. If the Nation is blind to this problem, our prime farmland will continue to shrink."

Edgar said the study showed that while the Northeast-Midwest region has approximately one-third of the Nation's prime farmland, it has less than 18 percent of total national reserves. "This means our region potentially is more vulnerable to the continuing atrophy of our best agricultural land," he said.

In addition to describing the loss of prime farmland, the report identifies some methods being used by States and localities to address the problem. An analysis of the farmland protection legislation being proposed in the 96th Congress also is included.

Copies of the report may be obtained free of charge from the Northeast-Midwest Institute, 3589 House Annex No. 2, Washington, D.C. 20515.

Reforestation by Injection "Guns"

In many countries, reforestation programs are being planned by governments increasingly concerned with the urgent need to correct the abuses of past logging practices and with the practical problems of reforestation now in progress. Problems in restoring forest land may include the long, hard hours of manual labor now required in tree planting, as well as short planting seasons, remote locations, and inadequate financial resources. As a result, foresters are exploring the idea of mechanized tree planting.

According to John Walters and R. St. Jean of the University of British Columbia Research Forest, injection planting of tree seedlings seems to offer the greatest potential for the mechanization of the planting process. The seedlings' containers must be "bullet-shaped" and rigid enough to withstand the impact of mechanical insertion into the ground. The young trees in these specially designed pots or "bullets" can be efficiently planted by inserting them into the ground with injection "guns."

Researchers at the University of British Columbia mounted three such guns on a U.S. Army surplus armored personnel carrier. The result: an automatic, self-propelled tree planter that can plant 20,000 seedlings in an 8-hour day. A major advantage in using the personnel carrier is that it can operate on slopes of up to 30 percent, and can easily maneuver over debris usually found in logged areas.

The bullets have two advantages: First, they provide maximum protection of tree seedlings during their transfer from nursery to planting site. Because seedlings in rigid containers can be planted before seedling roots become potbound, the bullets eliminate root deformation caused by most planting techniques. Second, the pot or bullet is designed to permit roots to grow out and soil moisture to seep in after planting. This can be accomplished either by container design only or by a combination of design and use of biodegradable materials.

A paper entitled "Self Propelled Tree-Planting Machine Using Injection Planting," by Walters and St. Jean, is available from the American Society of Agricultural Engineers. Call Roger Castenson at (616) 429-0300 and request Item WM-78-1586.

USDA Awards Top Honor to Boy Scout Council

Each year the U.S. Department of Agriculture recognizes a Boy Scout Council for outstanding work in conservation. This year's "Gold Seal Award," the top national honor, went to the Daniel Webster Council in Manchester, N.H. The Daniel Webster Council wrote a comprehensive conservation plan for managing its two camps, Hidden Valley Scout Reservation and Camp Carpenter, and has been enthusiastic and thorough in its implementation.

The council's ongoing conservation programs address forestry, wildlife, watershed management, recreation, and education. Wildlife projects include constructing wildlife ponds, trout spawning beds, and nesting boxes for wood ducks; identifying and inventorying deer yards and populations to help determine road and trail sites; and providing browse and cover by making brush piles and cuttings, and seeding with legumes. The camp, which averages 50 acres a year in timber stand improvement, employs a full-time forester who has developed a plan in controlled burning to accomplish the three objectives of timber management, wildlife habitat maintenance, and training in fire management and prevention. Under watershed management, the popular sport of swimming has given clean water in ponds top priority. The Scouts reduce pollution and sedimentation by building waterbars, and by seeding and mulching in open areas near ponds.

Clem Lyon has been directly involved in the Scouts' conservation projects both in his capacity as Soil Conservation Service district conservationist for Laconia County, and as chairperson of the conservation committee for the Hidden Valley camp. SCS has assisted the Scouts by helping to survey, design, construct, and supervise the work on 3 miles of woodland access roads and two wildlife ponds. When asked about USDA's selection, Lyon replied that the Daniel Webster Council earned the Gold Seal Award because of the " . . . magnitude of projects that have been done over a relatively short period of time" and because of the enthusiasm and volunteer work that the Scouts generated.

SCS Is Well Known in Iowa

According to a recent farmer poll in the *Des Moines Register*, the Soil Conservation Service is the most recognized and the most used Federal agricultural agency in Iowa. Of those polled, 97 percent had heard of SCS and 68 percent had used SCS services. SCS also ranked higher than any State agency.

Farm Agencies: How Useful Are They?

Have you used these agencies? Have you heard about them?

Federal Agencies	Yes, Used	Yes, Heard About
Soil Conservation Service	68%	97%
Agricultural Stabilization and Conservation Service	60	87
Federal Crop Insurance Corporation	32	88
Farmers Home Administration	24	87
Commodity Futures Trading Commission	14	78
Packers and Stockyards Administration	11	55
State Agencies		
Iowa State University Extension Service	65%	92%
ISU College of Veterinary Medicine	49	93
Iowa Dept. of Soil Conservation	47	91
Iowa Dept. of Agriculture	43	97
ISU College of Agriculture	39	86
Iowa Development Commission	9	64

Courtesy, Des Moines Register and Tribune Company.

by Robert J. Brejcha

Conservation Tillage Incentive

"When I leased this farm from my landlord some 6 or 7 years ago," said Jesse Dowdy, a farmer in Rayville, Mo., "he said he would lease it to me if I would cut down on erosion.

"At first, that seemed like quite a job until I talked it over with SCS District Conservationist Calvin Phillips."

Dowdy said he was impressed to know there were several conservation planning systems available through the local conservation district.

"The plan we worked out," he explained, "is in tune with my farming operation, saves the soil, and is keeping my landlord happy."

After Dowdy used a wheat and red clover rotation to control shattercane and other weeds, he planted fescue grass in the diminishing clover. With this system, he had weed control before trying no-till, which may be a key to the success of the system. To be effective, many weed control chemicals must be thoroughly incorporated into the soil immediately after application. Proper chemical incorporation can be a real problem if great amounts of residues remain on the surface.

In May 1978, Dowdy planted 50 acres of no-till corn in fescue sod and 25 acres in wheat stubble.

"This no-till system definitely saves the soil," said Dowdy.

Phillips concurred, "No-till, zero-till, conservation tillage, minimum tillage, or whatever you want to call it is a good alternative erosion control system."

Phillips also recommends that farmers plan ahead by selecting fields with uniform soil conditions and types. Extreme variations in stand and chemical

Missouri farmers might ask, "What's a planter doing in ground cover like this?" Conservation tillage is catching on in western Missouri. Farmer Jesse Dowdy was pleased with his 1978 results and planted no-till corn again in 1979. Other farmers in the area followed suit.

performance can occur if land with different kinds of cover is included in a single no-till planting.

According to Ted Puetz, a representative of the Chevron Chemical Company, "An insecticide attachment is a must for a no-till planter. It should be used for inrow application to control rootworm. A planter box seed treatment should also be used.

"As for fertilization," Puetz continued, "since phosphate and potash move slowly into the soil, they should be applied during the fall. This allows plenty of time for freezing and thawing to take them down into the root zone."

Nitrogen can be put in as an overlay or broadcast in the spring. It is soluble and the rain will leach it into the root zone. According to Puetz, another plus for applying nitrogen in the spring is that if it is used in solution, it can be mixed and applied with certain herbicides, thus eliminating an extra trip across the field.

Herbicides can be applied before or after planting, but must be applied before the corn emerges.

For those considering using herbicides, Puetz suggests answering the following questions:

- Which product can control my weed problem?
- Is there any possibility of having crop injury?
- Will the product carry over in the soil to the next crop?
- Is the formulation available and suitable for my equipment?
- Can it be mixed with liquid fertilizer carrier?
- Do I need special application nozzles or equipment?
- Does the product need to be incorporated? If so, how soon?
- Is the product affected by soil texture or organic content?
- Is the product adversely affected by drought or wet periods?
- Can the product be tank mixed with other herbicides to obtain a wide spectrum of weed control?
- Can the herbicide be used on more than one crop?
- In heavy rain, can the herbicide run off and damage grassed waterways or injure other crops?
- Will postemergence use create a drift hazard to adjacent crops?

Puetz says that three-fourths of herbicide failures can be traced to improper use.

Puetz offered the following no-till corn planting tips: "Don't plant when the ground is too wet. If it is too wet to plow, it is too wet to plant.

"Plant when soil temperature at seed depth at 9 a.m. is 50° F or higher. Plant shallow, about 1½ to 2 inches and plant slowly, about 3 or 4 miles per hour."

Eldon Ratcliffe, extension area agronomist in Richmond, Mo., adds another bit of advice, "As a system, conservation tillage must compete with conventional methods to be satisfactory. In most cases it can compete financially; but before farmers jump on the bandwagon, they should investigate the alternatives."

For many farmers, investigating new tillage systems will pay off by simply helping them evaluate whether their current practices can be modified or operations combined to cut down overall costs and save fuel.

Mr. Brejcha is resource conservationist, SCS, Independence, Mo.

Soil Conservation Service District Conservationist Calvin Phillips (left) works with Jesse Dowdy on his conservation plan.

No-Till Pays Off

by James E. Dean

Experimenting with reduced tillage has paid off for a South Georgia farmer and his son who have found the successful combination of experience, equipment, and conservation practices.

Carl and Randy Daughtry of Metter, Ga., farm 900 Coastal Plain acres of corn and rye and feed approximately 1,200 steers each year. With help from the Ogeechee River Soil and Water Conservation District (SWCD), this father and son team has experimented with several conservation tillage systems for the past 20 years.

The winning combination began to take shape in 1977 when the Daughtrys bought a machine that allows them to subsoil under the row, prepare a seedbed, plant the seed, and apply herbicides—all in one trip. They call it "No-tillage-plus."

Inrow subsoiling eliminated the plowpan that prevents deep root growth of crops in the Coastal Plain. Carl said, "I have tried planting without subsoiling and made half a crop. Subsoiling is the key to successful farming in our area."

The no-tillage system saves topsoil, according to the Daughtrys. "In my opinion no-till farming is the only method of soil conservation for our fields," Carl said. "Terracing and waterways are good, but they don't compare with no-till which includes vegetative cover and sod seeding. And we save money on fuel, equipment, and labor costs by reducing the number of trips over our fields."

The Daughtrys have planted in corn residue, in rye residue following grain harvest, and in standing rye.

"We have had less trouble and a better stand of corn by planting in standing rye, so we will plant all of our corn this way next year," Randy said. "We plant in standing rye that is about 4 feet high and spray three herbicides in the same operation. Paraquat, a strong contact agent, kills the living rye and weeds; atrazine will effectively control most broadleaf weeds; and alachlor controls summer grasses."

The no-tillage system also means increased yields. In 1978, the Daughtrys averaged 138 bushels of corn per acre in a 248-acre field irrigated three times with a center pivot irrigation system. A smaller field without irrigation averaged 154 bushels per acre. Their county's average corn yield was 40 bushels per acre in 1978.

"Carl and Randy have been pioneers in reduced tillage or no-tillage farming in our area, but their system does not stop with their cropland. Back in 1956, they became cooperators with the Ogeechee River SWCD. This allowed them to get technical help from the Soil Conservation Service in developing a conservation farm plan for their entire operation. The plan included no-tillage for their pastures because our area lacks a permanent winter pasture grass," said Owen E. Gay, chairperson of the board of supervisors of the Ogeechee River SWCD.

Each fall the Daughtrys overseed ryegrass and arrowleaf clover into Pensacola bahiagrass and Coastal bermudagrass with the aid of a PTO-driven machine which places the seed right in the old sod. The summer grasses are not destroyed, and the overseeding takes only one trip.

"No-tillage farming on the Daughtrys' farms has been featured in farm tours, television programs, and in newspaper articles. Thanks to the persistence and ingenuity of these two men, more farmers switched to no-tillage in 1979," said Owen Gay.

The Daughtrys have found that no-tillage works well on their South Georgia farm. After trying different methods and combinations, they produced the best stand of corn by planting in standing rye.

Mr. Dean is district conservationist, SCS, Metter, Ga.

RCA Update

The Soil and Water Resources Conservation Act (RCA) of 1977 (Public Law 95–192) requires that on the "first full day Congress convenes in 1980, and at each 5-year period thereafter as long as the act is in effect," a detailed "statement of policy regarding soil and water conservation in the United States" will be sent to Congress.

Guiding the RCA program is an interagency coordinating committee representing seven U.S. Department of Agriculture (USDA) agencies and USDA's Office of Budget, Planning, and Evaluation; the Office of Management and Budget; and the Council on Environmental Quality. The coordinating committee meets once a week to guide RCA work. These meetings are open to the public. David G. Unger, Deputy Assistant Secretary of Conservation, Research, and Education, serves as chairperson of the coordinating committee.

The 1980 RCA Draft Appraisal and Program documents will be distributed for public review this fall. Primarily, the review is designed to obtain the public's views on the alternative strategies for the conservation, protection, environmental improvement, and enhancement of soil and water resources. Each alternative strategy will be a relatively complete "package" of actions and activities that could be undertaken by USDA to meet the Nation's soil and water conservation needs. The social, environmental, and economic impacts and tradeoffs of each alternative strategy will be presented to aid in making comparisons and evaluations.

During the public review period, a series of regional meetings will be held. The meetings will be conducted by Washington, D.C., based RCA teams. There will be afternoon and evening meetings scheduled for each location. The meetings will allow team members to capture regional perspectives of public reaction to the RCA documents and, in particular, the alternative strategies. A transcript will be taken at each session.

Provisions are also being made to handle public comments made by mail by those people wishing to submit written comments or those unable to attend one of the regional meetings. The RCA draft documents will have complete instructions on where and how to submit written comments.

Meetings:

August	
5–8	National Farm & Power Equipment Dealers Association, Detroit, Mich.
5–10	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Fort Collins, Colo.
12–16	Conservation Education Association, Dingmans Ferry, Pa.
19–22	American Institute of Chemical Engineers, Boston, Mass.
September	
5–7	American Water Works Association, Chesapeake Section, Ocean City, Md.
9–12	International Association of Fish and Wildlife Agencies, West Yellowstone, Mont.
12–14	American Fisheries Society, West Yellowstone, Mont.
24–28	Federal Bar Association, San Antonio, Tex.
25–28	National Conference of Editorial Writers, Phoenix, Ariz.
26–30	The American Horticultural Society, Palm Beach, Fla.
30–Oct. 3	Farm and Industrial Equipment Institute, San Francisco, Calif.
30–Oct. 4	National Association County Agricultural Agents, Rapid City, S. Dak.
October	
3–7	American Horticultural Society, Portland, Oreg.
7–12	Water Pollution Control Federation, Houston, Tex.
10–12	Hardwood Plywood Manufacturers Association, Los Angeles, Calif.
12–18	American Association of State Highway and Transportation Officials, Hartford, Conn.
13–17	American Society of Planning Officials, Baltimore, Md.
14–17	Society of American Foresters, Boston, Mass.
16–18	Agricultural Research Institute, Washington, D.C.
20–25	National Environmental Sanitation & Maintenance Educational Conference/ Exposition, Clearwater Beach, Fla.
22–26	American Society of Civil Engineers, Atlanta, Ga.
25–28	National Association of Biology Teachers, Inc., New Orleans, La.
28–31	American Forestry Association, Charleston, S.C.
28–Nov. 1	Congress for Recreation and Parks, New Orleans, La.
31–Nov. 4	The American Society of Landscape Architects, New Orleans, La.

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